KOSOVO

CLUSTER AND BUSINESS SUPPORT PROJECT

Processing Equipment for Fruit and Vegetables

Contract #AFP-I-00-03-00030-00, TO# 800

Submitted to:
USAID/Kosovo
Cognizant Technical Officer: Timothy Hammann

Submitted by:
Chemonics International Inc.

Submitted: July 19, 2005

This report was written by the KCBS team of Chemonics International Inc. based on a Final Report prepared by Short Term Technical Advisor, Mr. Henry Penner.

CONTENTS

PURPOSE OF ASSIGNMENT

This assignment is designed to:

- Assist a previously identified host, Devolli, to create a complete implementation plan for the procurement of a fruit juice concentrate line;
- Consult on the creation of value added products (juice recipes); and
- Assist in forging positive relations with growers and the processing company so that Devolli can source local inputs instead of importing the components of their entire product line.

During this assignment the consultant should report directly to the long term fruit and vegetable cluster advisor, Mr. Matt Tokar.

BACKGROUND

The processing industry for fruit juices in Kosovo is overdeveloped. There are eight juice processing companies for an entity of less than 2 million people. Frustrating this situation further, all domestic juice processors import 100% of their concentrates. Facilities do not currently exist to produce concentrate in Kosovo. KCBS has identified a significant market opportunity to integrate production with processing activities. Time is of the essence in creating value-added products driven by demand that illustrate the ability of Kosovo to be a viable commercial entity and forge an integrated production system.

Currently Devolli has three food related business lines:

- Coffee
- Fruit Juices
- Ultra High Temperature (UHT) Milk

Of the three business units described above the fruit juice business line is the newest addition. The current processing line is a Tetrapac facility producing roughly 30,000 liters per day. The current juice varieties include:
Peach; Multivitamin; Sour Cherry; Apple; Blueberry; Pear; Orange; Strawberry

Blueberry, sour cherry, apple, tomato, strawberries, and raspberries are grown in Kosovo currently and are among the varieties that have been identified as having potential for integrated production and processing. Associations have been identified for collection of these crops although supply chain issues will need to be resolved.

EXECUTIVE SUMMARY

This project started with field visits to 10 processors and 6 stores. Assessments of these facilities and interviews with the management led to a number of conclusions regarding the feasibility of starting a fruit juice concentrate facility. Data assembled from these visits and technical data acquired from other sources helped to determine: (1) the size of the domestic market, (2) the volume of consumption of juices in Kosovo, (3) the cost of capital equipment for a fruit juice concentrating plant, (4) the amount of fruit needed to replace the imported fruit juice concentrate, (5) the cost of producing a 1-liter package of Tetra Pak drink, and (6) world fruit juice concentrate prices. The appendix to this report contains these data.

It became obvious fairly early in the investigation that the total requirements of the industry were not enough to keep even a relatively modestly sized concentrating factory in business. As well, there is virtually no fruit available at the present time for processing.

Normally the processed fruit sector is fed from the fresh fruit sector, especially in tree fruits. An exception to this is sour cherries. There is no possibility that an apple grower can make a living growing fruit for the processor. Even with apples at no cost, a processor would have a difficult time competing with the Chinese who have flooded the world market with over supply and low prices. One cannot build a factory with no assurance of supply of raw material and one cannot plant trees, which will take 5 years to produce, without some assurance of a buyer for one's product.

However, there are some opportunities in the small fruits sector, which is having a market boom at the moment. These fruits (blueberries, blackberries, black currants, raspberries, etc.) are very perishable and thus are ideal for processing. Crops can be harvested in the second year after planting and thus do not have such a long investment period. Processing equipment for these products in the individually quick frozen (IQF) form or in purees or puree concentrates is much more simple and much less expensive than that of fruit juice concentrating.

There are two production facilities in Kosovo that could have the necessary facilities to make fruit puree concentrate. There are, however, no aseptic filling capabilities. One of the facilities (Eriniku) was not made available for site inspection. The second factory (Progres) can make puree and has freezing capabilities as well as 5,000 mt of frozen storage capacity. The juice filling companies do not use frozen purees at this time but could be persuaded if the economics were right. One juice processor (Laberion) is using imported "single strength" (not concentrated) puree in some of their products. The General Director expressed interest in either investing with someone else for installing a puree processing line or investing himself. He was hesitant to team up with either of the two companies that we identified as having existing equipment because of their management structure and attitude. Other juice processors expressed the same sentiment.

As this interest seemed to be the best opportunity to explore, we concentrated in developing a model process operation for the Laberion Company. This model could be developed in several stages including, initially, making fruit purees, followed by making fruit puree concentrate, and finally making other concentrated products such as jams, marmalades, and ketchup. The model line (see appendix) is illustrated with all imported machinery. However, many of the pieces could be easily manufactured in existing fabrication shops in Kosovo creating more jobs. Laberion also has several

pieces of expensive equipment necessary for the puree production already in place. These pieces may possibly be used if production scheduling can be worked out to use this equipment for juice as well as for puree. Although this model was created for a specific client, it would be suitable for any operation and could be used for other processors if the opportunity arises.

During this project, assistance was also provided to other project members working with french fry potatoes and blueberries. Technical assistance was provided for a blueberry sorting line. French fry production, freezing, and the addition of additives were also discussed with potato processors. A total of 12 field trips were conducted (10 to processing facilities and 2 to the marketplace).

TASK FINDINGS AND RECOMMENDATIONS

- The market is saturated with brands of fruit juice from concentrate, both domestic and foreign. Twenty-three brands were found in six stores; sixteen of the brands were foreign produced.
- Market pricing leaves almost no margins on the “low end” products.
- No fruit producing farms were observed when traveling through the countryside.
- A few “back yard” orchards were seen.
- The local fresh produce wholesale market had virtually no local produce.
- The land is producing low value crops such as grass and maize.
- There is the potential for a small and soft fruits industry.
- The marketplace seems to contradict the information received from the individual processors. I am not convinced that the processors understand marketing.
- The amount of concentrates purchased by the entire juice and nectar sector of the market would not justify the costs of establishing a fruit juice concentrate factory.
- Two current establishments have the capability of producing fruit puree concentrates. However, neither one has aseptic filling capability.

CONCLUSIONS AND RECOMMENDATIONS FOR FUTURE ACTIVITY

- About 5,000 mt of fruit is required to replace the entire quantity of fruit juice concentrate imported to Kosovo. This number is, of course, only fruit that could be grown domestically.
- Only a small amount of the fruit required is available at the present time (there is, however, no definitive data available). Even processors in neighboring countries (Macedonia) are short of supply of process fruit.[1]
- There is a proliferation of juice brands on the Kosovo market (23). Any two filling operations could supply the entire market. There is a huge overcapacity.
- The direct costs to produce 1 liter of Tetra Pak drink is in the range of: € 0.25 and € 0.27. The wholesale price is in the range of € 0.36 and € 0.40 per liter. This leaves € 0.09 to € 0.15 per liter for overhead costs and profits, which is a very tight margin.
- There will be a settling out of brands in the near future with the most competitive brands surviving.
- The returns for fruit based on world concentrate prices would be approximately, € 0/mt for apples, € 270/mt for sour cherries, and € 1,000/mt for blueberries.
- Purchasing and installing a fruit juice concentrate line is not economically feasible at this time. There are better alternatives.
- The process industry must be an off-shoot of the fresh fruit packing industry. This may require a grouping of growers working together to pack fruit and then subsequently processing the fruit, which is unsuitable or a surplus. The small fruits by their perishable nature will generally require processing of some type.
- Puree processing is a viable option to utilize the available fruit and is an interim step to developing a fruit processing industry.
- There are two factories capable of puree processing at the present time and at least one company interested in investing in their own puree processing equipment.
- Blueberries and other small fruits could be easily grown and developed into a viable industry. As well, there is a freezing facility under construction at Pestova that can be used for freezing small fruits.

[1] Roman Herchak, Final Report, *Best/Worse Management Practices Analysis of Processors and Traders in the Sub-Sectors of Tomato-Paprika and Apple.*

KOSOVO

CLUSTER AND BUSINESS SUPPORT PROJECT

Processing Equipment for Fruit and Vegetables

Annexes

Annex 1 - Results of a Limited Market Study

Large Super Markets (3) and Mini Markets (3)

Prices of 1 Liter Tetra Pak Juice containers:

Brands	Flavors					
	Apple	**Cherry**	**Blueberry**	**Strawberry**	**Peach**	**Orange**
Hit	€ 0.50	€ 0.50	€ 0.50	€ 0.50	€ 0.50	€ 0.50
Tango	€ 0.45	€ 0.45		€ 0.49	€ 0.49	€ 0.50
Frutti	€ 0.65	€ 0.60	€ 0.70	€ 0.70		€ 0.90
Dolce Vita	€ 0.75		€ 0.70	€ 0.75	€ 0.75	€ 0.70
Maxi	€ 0.50	€ 0.50	€ 0.49			
Dona	€ 0.50	€ 0.50	€ 0.50		€ 0.50	€ 0.50
Average	**€ 0.59**	**€ 0.51**	**€ 0.63**	**€ 0.61**	**€ 0.56**	**€ 0.60**
Foreign Brands						
Top Joy	€ 0.85	€ 0.75	€ 0.75		€ 0.80	€ 0.65
La Vita	€ 0.50			€ 0.50	€ 0.50	
Sun Gold	€ 0.50					
Fructal	€ 0.80		€ 0.90		€ 0.55	€ 0.50
Western European Brands	**€ 1.00**	**€ 1.15**		**€ 1.30**	**€ 1.25**	**€ 1.10**

Other Brands in the Markets:
Lero
Santal
Happy Day
Bravo
Aonis
Spitz
Nita
Necta
Pfanner
Divi
Ego
Ritam
Viva
Eks
Granini

Total Number of Brands Found in Six Stores: 23
Total Number of Foreign Brands: 16

Annex 2 - Costing Model to Determine Profitability of 1 Liter Tetra Pak Juices

Ingredients	Apple						Blueberry		Sour Cherry	
	40% Concentrate		10% Concentrate		100% Concentrate		40% Concentrate		40% Concentrate	
	$	€	$	€	$	€	$	€	$	€
Labor	0.05	0.04	0.05	0.04	0.05	0.04	0.05	0.04	0.05	0.04
Sugar	0.36	0.29	0.54	0.43			0.36	0.29	0.36	0.29
Essence	0.13	0.10	0.13	0.10	0.13	0.10	0.13	0.10	0.13	0.10
Citric acid	0.03	0.02	0.03	0.02	0.03		0.02	0.02	0.02	0.02
Concentrate	0.63	0.50	0.16	0.13	1.60	1.28	11.10	8.88	3.49	2.79
Total ingredients	**1.19**	0.95	**0.91**	0.73	**1.81**	1.45	**11.66**	9.33	4.05	3.24
Production material										
Cartons	1.80	1.44	1.80	1.44	1.80	1.44	1.80	1.44	1.80	1.44
Tray	0.32	0.26	0.32	0.26	0.32	0.26	0.32	0.26	0.32	0.26
Miscellaneous	0.70	0.56	0.70	0.56	0.70	0.56	0.70	0.56	0.70	0.56
Total production material	**2.82**	2.26	**2.82**	2.26	**2.82**	2.26	**2.82**	2.26	2.82	2.26
Total case costs	4.01	3.21	3.73	2.98	4.63	3.70	14.48	11.58	6.88	5.50
Costs per liter	**0.33**	**0.27**	**0.31**	**0.25**	**0.39**	**0.31**	**1.21**	**0.97**	**0.58**	**0.46**
Administrative & overhead 25%	0.08	0.07	0.08	0.06	0.10	0.08	0.30	0.24	0.14	0.11
Total costs	0.42	0.33	0.39	0.31	0.48	0.39	1.51	1.21	0.71	0.57
Selling price 25%	0.52	0.42	0.49	0.39	0.60	0.48	1.89	1.51	0.90	0.72
Retail markup 25%	0.65	0.52	0.61	0.49	0.75	0.60	2.36	1.89	1.11	0.89
Average Price in Market	**0.87**	**0.70**	**0.62**	**0.50**		**0.00**	**0.87**	**0.70**	**0.88**	**0.70**

Notes:

Administration costs and markups are just estimates for costing purposes.

Concentrate prices: apple—$4/US gal; cherry—$22/US gal; blueberry—$70/US gal (world market prices June/05).

These figures will vary according to volumes produced and market dynamics.

Annex 3 - Market Size Estimates

Market Size Extrapolated From Devolli Figures

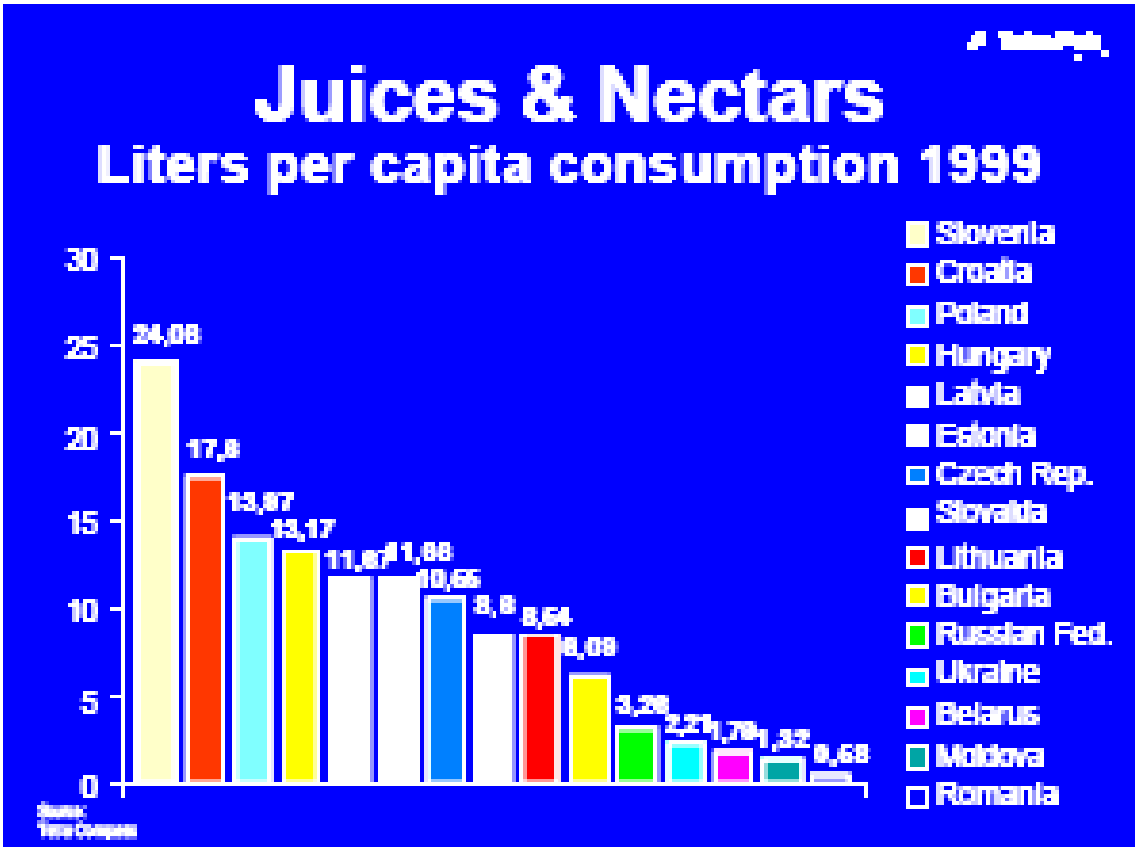
	3 days/week		4 days/week	4 days/week
Production capacity	6,000	liters/hour	6,000	6,000
Hours per year (3 days per week)	1,250		1,664	1,664
Line efficiency at 80%	0.80		0.80	0.80
Liters per year	6,000,000		7,987,200	7,987,200
Devolli market share 15%	0.15		0.15	0.15
Total market	40,000,000		53,248,000	53,248,000
Products that could be local	**50%**		**50%**	**60%**
Fresh fruit juice yield	750	liters/mt	750	750
Equivalent of fruit required (mt)	26,667		35,499	42,598
Average fruit juice content	0.25		0.25	0.25
Local fruit required (mt)	**6,667**		**8,875**	**10,650**

Note: Based on Devolli claiming 15% market share.
Production based on assumptions of working 8 hours per day for 3 or 4 days per week.

Market Size Extrapolated From Dona Figures

Total market size	42,000,000	liters
Consumption per capita	21	liters/capita
Domestic products	70%	
Kosovo production	29,400,000	liters
Production that could be local fruit	14,700,000	(50%)
Fresh fruit juice yield	750	liters/mt
Equivalent of fruit required (mt)	19,600	mt
Average fruit juice content	25%	
Local fruit required (mt)	**4,900**	**mt**

Annex 4 - Total Consumption of Juices and Nectars in Eastern Europe in 1999



Market size Extrapolated From Eastern European Fruit Juice and Nectar Consumption Figures (1999)

Population of Kosovo	2,000,000			2,000,000	
Estimated consumption per capita	10	liters/capita		10	liters/capita
Total market consumption	20,000,000	liters		20,000,000	liters
Products that could be local	10,000,000	**(50%)**		12,000,000	**(60%)**
Fresh fruit juice yield	750	liters/mt		750	liters/mt
Equivalent of fruit required (mt)	13,333	mt		16,000	mt
Average fruit juice content	25%			25%	
Local fruit required (mt)	**3,333**	mt		**4,000**	mt

Annex 5 - Estimate of Total Metric Tons of Fruit Required to Replace Imported Concentrates

Devolli extrapolation:	6,700	mt
Dona extrapolation:	4,900	mt
Eastern Europe:	4,000	mt
Average:	5,200	mt

	Devolli	Dona	Eastern Europe	Average
Factory capital cost	€ 1,000,000	€ 1,000,000	€ 1,000,000	€ 1,000,000
Interest rate (5%)	5.00%	5.00%	5.00%	5.00%
Annual simple interest	€ 50,000	€ 50,000	€ 50,000	€ 50,000
Depreciation rate	10%	10%	10%	10%
Depreciation	€ 100,000	€ 100,000	€ 100,000	€ 100,000
Interest and depreciation	€ 150,000	€ 150,000	€ 150,000	€ 150,000
Fruit (mt)	**6,700**	**4,900**	**4,000**	**5,200**
Capital costs/mt	**€ 22.39**	**€ 30.61**	**€ 37.50**	**€ 28.85**

Notes:

1. The Devolli and Dona figures appear to be inflated.
2. The percentage of actual fruit juice content estimation is probably overestimated.
3. The estimate of the amount of fruit juice concentrate used in Kosovo is likely the maximum possible in this report.

Annex 6 - Costing for Manufacturing Juice Concentrates

To Establish Possible Returns to Farmers

	Apples		Cherries		Blueberries	
Fruit (mt)		1		1		1
Yield		80		70		80
Raw juice		800		700		800
Filter loss		5%		5%		5%
Net yield		760		665		760
Brix		13		15		10
Liters of concentrate		95		89		80
Market value of concentrate	$4	€ 0.85	22.00	€ 4.65	70.00	€ 14.80
Total value of 1 ton		€ 80.32		€ 412.29		€ 1,183.62
Operating costs						
Price of fruit	€ 0	€ 0.00	€ 273.00	€ 3.05	€ 1,042.00	€ 13.00
Aseptic packaging/220 liters	20	€ 0.09	20	€ 0.09	20	€ 0.09
Mash treatment enzyme/liter	0.001	€ 0.80	0.001	€ 0.70	0.001	€ 0.80
Depectinizing enzyme/liter	0.0007	€ 0.53	0.0007	€ 0.47	0.0007	€ 0.53
Utilities	3.6	€ 0.04	3.6	€ 0.04	3.6	€ 0.05
Labor (€ 15/day)	225	€ 0.06	225	€ 0.06	225	€ 0.07
Filter aid	3.125	€ 0.03	3.125	€ 0.04	3.125	€ 0.04
Depreciation and interest on investment (based on 5,000 mt input)	15	€ 0.16	15	€ 0..17	15	€ 0.19
Total operating costs (per liter)		€ 1.71		€ 4.64		€ 14.79
Total operating costs (per mt)		€ 162.53		€ 411.75		€ 1,183.18
Margin		**-€ 0.87**		**-€ 0.01**		**-€ 0.01**

Notes:

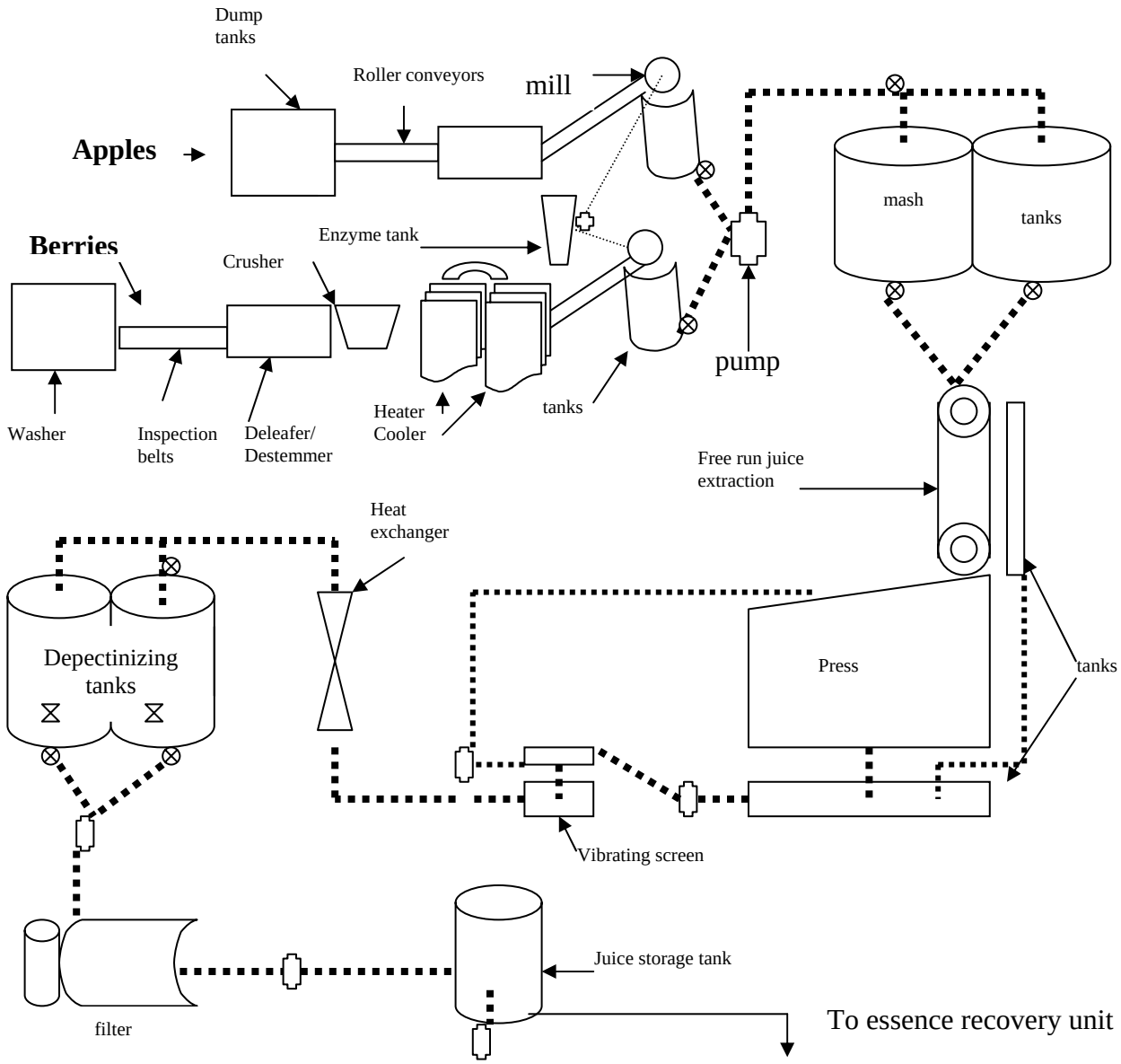
Prices for concentrates are: apple—$4/US gal; cherry—$22/US gal; blueberry—$70/US gal (World prices June/05)[2]

Exchange rate: US $1 = € 0.8.

According to the above chart, a processor would be able to return € 1,042/mt of blueberries, € 273/mt of sour cherries, and nothing for apples (less profits).

[2] Don Yule, purchasing agent Sun-Rype Products limited.

Annex 7 - Fruit Juice Concentrate Processing Line



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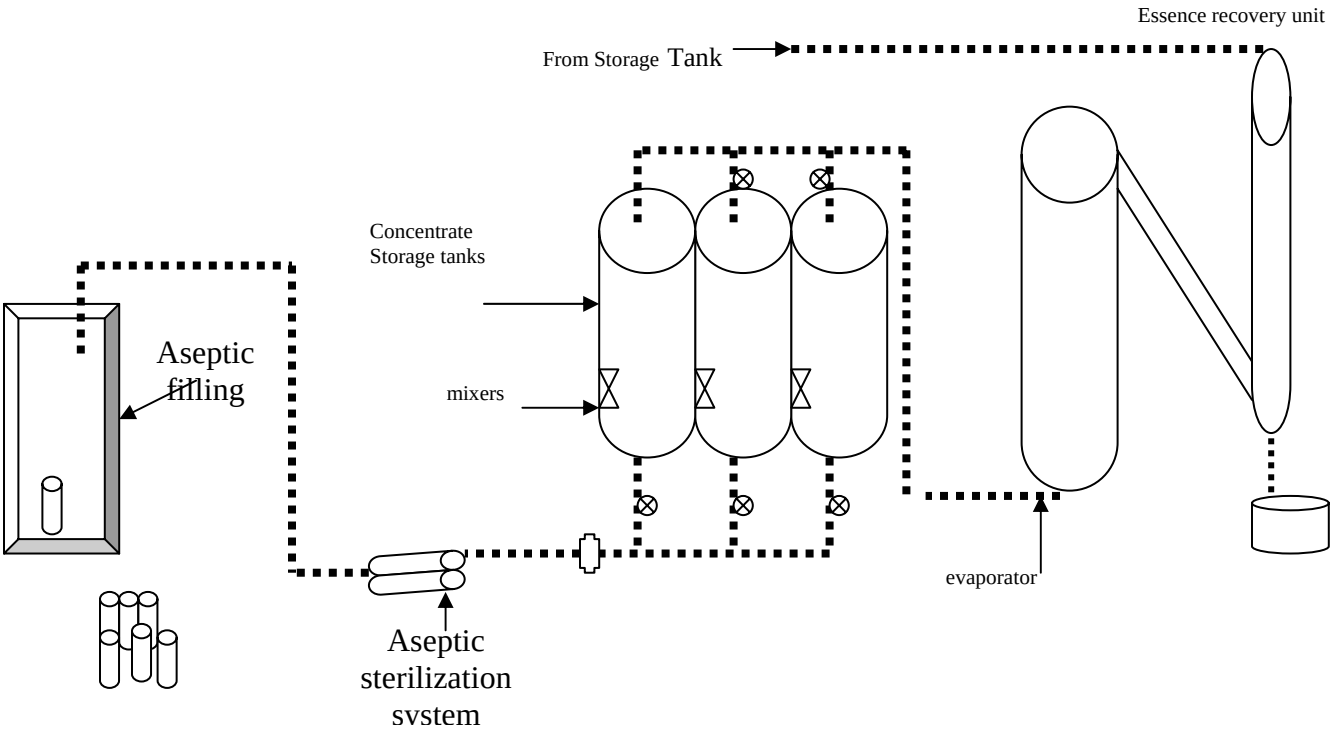

Essence recovery unit
From Storage Tank
Concentrate
Storage tanks
mixers
Aseptic
filling
evaporator
Aseptic
sterilization
svstem

Equipment Capacity Requirements

Item	Capacity
Evaporator	4 mt per hour input
Essence recovery	4.5 mt per hour input
Aseptic filling	1.0 mt per hour
Fruit press	5 mt per hour
Juice filter	6000 liters per hour
Process tanks	(2) 1,000 liter, (5) 20,000 liter, (3) 8,000 liter
Cool storage	40 mt
Fruit washers	5 mt per hour each
Mills	5 mt per hour each
Pumps	
Destemmer	5 mt per hour
Cooker/cooler	5 mt per hour

Equipment Cost Estimates[a]

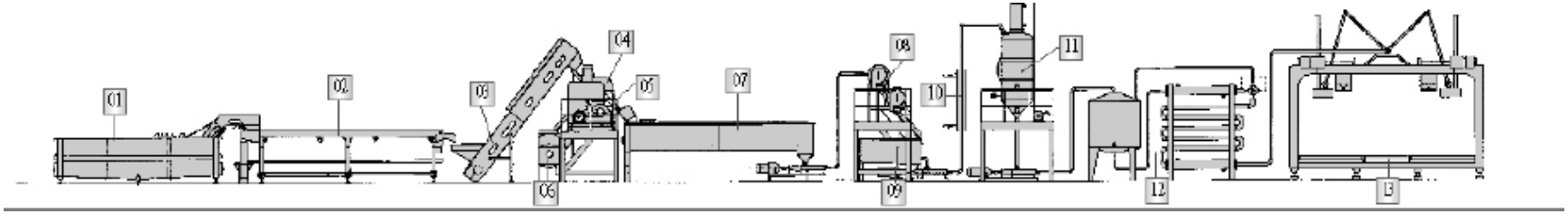
Equipment	Cost	New/Used	Build Self	Source
	($)			
Evaporator	300,000	Used	No	Worldwide
Essence recovery	100,000	Used	No	Worldwide
Aseptic filling	200,000	Used	No	Worldwide
Fruit press	100,000	Used	No	Worldwide
Juice filter	40,000	Used	No	Western Europe
Process tanks	30,000	Either	Maybe	Domestic
Cool storage	150,000		Yes	
Fruit washers	4,000		Yes	
Conveyors	4,000		Yes	
Mills	10,000	Used	No	Worldwide
Pumps	10,000	Used	No	Worldwide
Destemmer	2,000	Used	No	Worldwide
Fork lifts	20,000	Used	No	Domestic
Cooker/cooler	20,000	Used	Maybe	Western Europe
Laboratory equipment	10,000	Used		Western Europe
Miscellaneous equipment	30,000	Used		Western Europe
Crusher	5,000		Yes	
Total	**1,035,000**			

a. Costs are only a broad estimate in that there were no quotations given for any of the equipment. Most of the equipment can be purchased used at a fraction of the original price. The figures are all in U.S. dollars. Purchase of a complete factory line intact would probably be more cost effective.

Note: Factory buildings and infrastructure are not included in these costs.

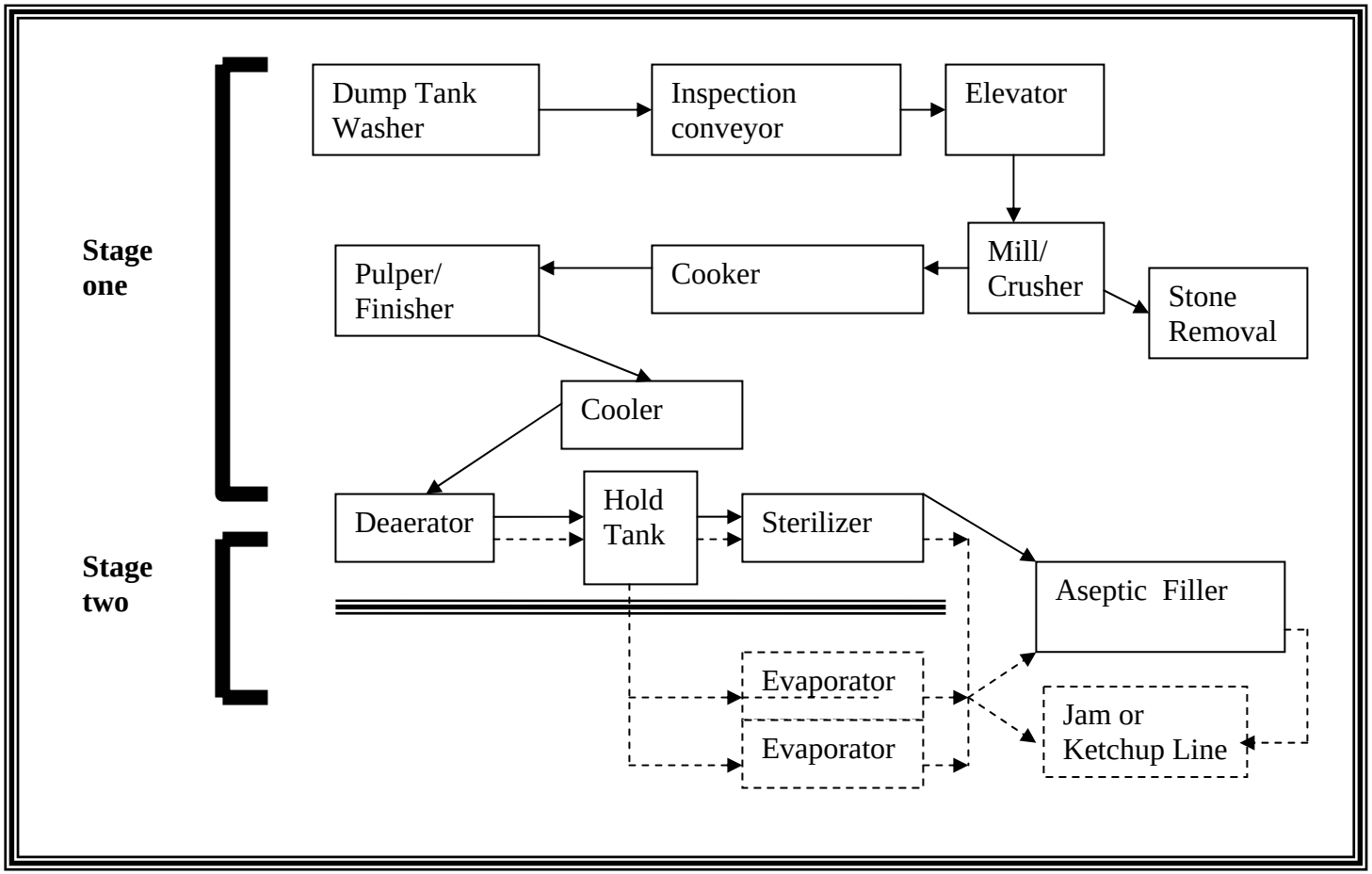
Annex 8 - Laberion Proposal for a Boema® Aseptic Puree Processing Line

The Laberion Company has expressed an interest in producing aseptic purees from fruit grown in Kosovo. Below is an example of a complete puree processing operation. No quotes on costs have been received to date. Much of the equipment illustrated can be purchased on the second-hand equipment market and much of the equipment can also be built domestically at a fraction of the new purchase price. Items (01) to (07) could be built in Kosovo using existing fabricators. The Laberion Company already has a boiler and infrastructure in place to accommodate a line such as this. In addition, they have an aerator and sterilizer utilized for their fruit juice lines, which could perhaps be used for puree if scheduling permits. It is anticipated the production operation would be sized for an input of 5 mt per hour. Examples of sterilizers/evaporators are included in this report as that is a natural progression for the company to take. This equipment would be capable of producing fruit puree concentrates, jams, marmalades, ketchup, etc. A multiple batch system would ensure a continuous production flow.



Legend		Function
01.	Dump/wash tank	To dump fruit to line, remove rocks, and wash fruit
02.	Inspection conveyor	To remove unsuitable fruit and remove debris
03	Fruit elevator	To transport fruit to crusher/destoner
04	Crusher/destoner	To crush fruit prior to cooking
05	Strainer	To separate stones from fruit
06	Stone discharge	To remove stones
07	Trough cooker	To cook fruit prior to pulping
08	Turbo strainer refiner	To strain fruit into the desired consistency
09	Holding tank	To hold puree for continuous flow to the deaerator
10	Precooler	To cool the product as quickly as possible
11	Deaerator	To remove air from product to prevent oxidation
12	Sterilizer	To prepare puree for aseptic filling
13	Aseptic filler	To fill aseptic packages

Line Layout for a Multiple Stage Process Implementation for Puree Processing



Dump Tank/Washer

Inspection Conveyor

Elevating Conveyor

Crusher/Destoner

Stone Cleaner

Trough Cooker

Turbo Strainer Refiner

Alternate to Trough Cooker

Deaerator

Sterilizer

Batch Sterilizer (Bertuzzi)

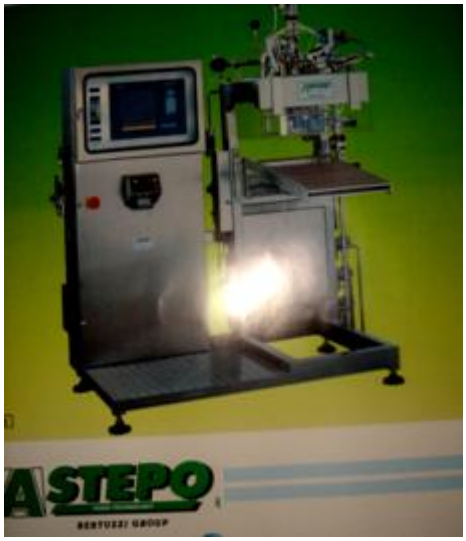
ASTEPO designs and construct "aseptic pan" batch sterilizers, specially studied for thermal treatment and aseptic filling in the fruit transformation industry (products with pieces, wildberries) to obtain bases for yogurt, confectionery, etc.
This specific and original type of plant carries out the following operations:

1. Feeding of fruit in pieces or rolling (frozen too)
2. Homogeneous mixing of various ingredients in the whole mass
3. Vacuum concentration up to the desired Brix degree
4. Pasteurizing/sterilizing at the temperature and for the requested resting time according to the product type and operator selection
5. Rapid cooling of the entire mass
6. Sterile adding of flavors and additives
7. Product transferring—without pump—in sterile tanks of 200-800–1,000 liters or in flexible bags ranging in size from 3 to 1,000 liters (bag-in-box type).

All these operations are carried out in a delicate way to avoid fruit breaking and controlled by an electronic control panel with auto-diagnostic to avoid any human mistake. The parts in contact with product are in stainless steel AISI 316, the thermal exchange is indirect type and can be modulated in all the phases, according to type of product characteristics. These sterilizing plants are available on request with pan with effective volume of 800 or 1600 lt, even linkable. Construction is on skid and in compliance with CEE standards.

Tabanli Continuous Batch Sterilizer/Evaporator

Aseptic Filler



Alternate Aseptic Filler

Annex 9 - Progres Company, Puree Processing

Field Trip Report

Henry Penner, Fruit Concentrate Specialist

Date: June 20, 2005

Region: Prizren

Processor: Progres

Brands:

Purpose: To view facilities, determine capability of handling blueberries, view the freezing and storage facilities, and determine capability of making fruit juice concentrates.

Meetings with: Irfan Fusha, owner; lab technician; other owner

Notes:

- Good washing and inspection equipment for blueberries. No mechanical means of removing debris from fruit.
- Capable of running 3 mt/hour.
- The company has two small vacuum evaporators that would be capable of producing fruit puree concentrates. They also have pulpers, cookers, and finishers for making purees.
- There is no equipment for extracting, treating, depectinizing, or clarifying any juice products.
- There is a belt freezer that was used for freezing vegetables in place. It appears to be in operating condition. This equipment would be suitable for IQF blueberries.
- There are five rooms with 1,000-mt capacity each for frozen storage. These rooms are metal lined and in reasonable condition. There are mobile racks for stacking the product to the ceiling.
- Price of cherries: € 300/mt.
- Price of apples: € 100/mt.
- No local fruit available.

Equipment Located at Progres

Berry Washer

Inspection Conveyor

Blueberry Sizer

Elevator to Freezer

Cookers

Frozen Storage Racks

Annex 10 - Delta-Pomfrit Visit

Field Trip Report

Henry Penner, Fruit Concentrate Specialist

Date: June 21, 2005

Region: Gjilan

Processor: Delta-Pomfrit

Brands: Delta-Pomfrit

Purpose: To observe the French fry operation and to give any technical assistance that we could provide.

Meetings with: Enver Sherifi, owner, and his brother, Hysri Sherifi.

Notes:

- Very nice cottage-type operation with less than 10 operating personnel.
- The plant is sanitary and efficient, albeit very small.
- Abrasion peeler (German).
- Hand trimming.
- Slicer (German).
- Water blanch.
- Fryer.
- Freezing racks.
- Freezer.
- Plastic bag sealer.
- Freezer storage.
- They are looking for knowledge of how to make “white fries” from yellow potatoes. They believe that there are additives for this purpose. STC committed to a short search if time permitted (see page 27).
- They have penetrated the local French fry market in the restaurant sector. They are a low priced supplier for frozen and fresh fries. I would doubt that they are the “low cost” supplier.

Pomfrit Production Line

Peeler

Inspection & Trimming

Trimming

Slicing

Anti-Oxidizing &Chip Separation

Water Blanching & Frying

Scale for Packaging

Plastic Bags

Annex 11 - Results of Search on Flavors and Additives Requested by Delta-Pomfrit

In the United States, the flavor industry is concentrated in New Jersey. International Flavors & Fragrances (IFF), the world's largest flavor company, has a manufacturing facility in Dayton, New Jersey; Givaudan, the world's second-largest flavor company, has a plant in East Hanover. Haarmann & Reimer, the largest German flavor company, and Takasago, the largest Japanese flavor company, both have plants in Teterboro. Flavor Dynamics has a plant in South Plainfield; Frutarom is in North Bergen; Elan Chemical is in Newark. Dozens of companies manufacture flavors in the corridor between Teaneck and South Brunswick. Altogether the area produces about two-thirds of the flavor additives sold in the United States.

Other Additives

Edible coatings act as barriers to moisture, gas, and oil uptake. Such coatings are used in reduced-fat battered and breaded foodservice. An edible system, called Fry Shield, developed and patented by Kerry Ingredients, Beloit, Wisconsin, and Hercules, Wilmington, Delaware, is one example. The system reacts a pectin solution with bread crumbs or batters containing a calcium source. The film formed by the calcium-reactive pectin reduces the amount of fat uptake during frying. It is also said to reduce moisture loss increasing yields. The system can reduce the amount of fat uptake in fried fish, vegetables, chicken nuggets, and other items during frying by 20%-40%. Hercules has also explored a technology that used pectin as an oil barrier in French fries. This technology binds potato cells together, which improves the resistance to oil penetrations. French-fried potatoes prepared using the specially developed pectin absorb only one-half the fat of regular French fries.

Gellan gum, approved by the Food and Drug Administration (FDA) as a stabilizer and thickener, reacts with mono- and divalent salts to form films. Gellan gum, marketed as Kelcogel®, can also act as a barrier to oil absorption in battered and fried foods, and is reported to prevent batter blow off. Such gellan gum-based coatings have been used for several years in Japan and other Asian countries with tempura-type fried foods.

Methylcellulose and hydroxypropyl cellulose (Dow Chemical Co.) decrease oil absorption during frying of French fries and onion rings. Methylcellulose has also been used

to coat fruit and prevent moisture loss. Finally, hydroxypropyl cellulose films are marketed by Watson Foods, West Haven, Connecticut. The films are used to form pouches that allow processors to add premeasured amounts of additives such as colorants and vitamin premixes directly without further handling.

Givaudan Flavor **(**an example of flavorings used for french fries)

Chemical name: 2-Methyl tetrahydrofuran-3-one

Synonym: Dihydro-2-methyl-3(2H)furanone

Formula: $C_5H_8O_2$

CAS No.: 3188-00-9

Molecular weight: 100.12

Organoleptic character: Bread, Brown, Aromatic, Nutty

Description: This chemical is effective in completing brown notes for nut and beef flavors.

Recommended flavor usage: Hazelnut, Beef, Fried Potato

Recommended use level: 5-10 ppm

Annex 12 – Pestova Visit

Field Trip Report

Henry Penner, Fruit Concentrate Specialist

Date: June 29, 2005

Region: Pestova

Processor: Pestova

Brands: Pestova

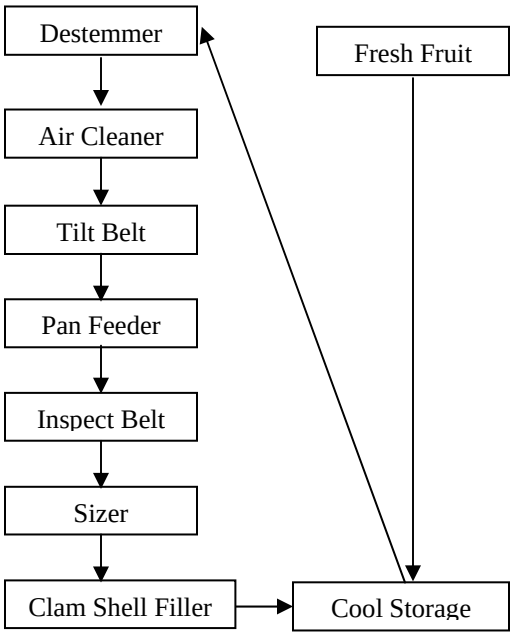
Purpose: To provide technical advice for freezing French-fried potatoes.

Meetings with: Bedri Kosumi, owner.

Notes:

- The plant was not in production.
- Have trouble storing potatoes past February.
- Handles 10,000 mt of potatoes (fresh and processed).
- Have ordered a liquid nitrogen/CO_2 freezer, which isn't the right piece of equipment for the job.
- STC suggested that Pestova find more high value products to freeze with this equipment because it is a high cost freezer.
- Kosumi wishes to freeze at -5°C. We tried to dissuade him because he will be sacrificing quality for cost. The fries will tend to be mushy under those circumstances. Indicated optimum freezing temperatures are -18°C to -23°C.
- Provided data for frozen French fry production.
- STC recommended investigation of the possibility of using a liquid nitrogen generator to provide gas for the freezer.

Annex 13 - Fresh Pack Blueberries Operations:

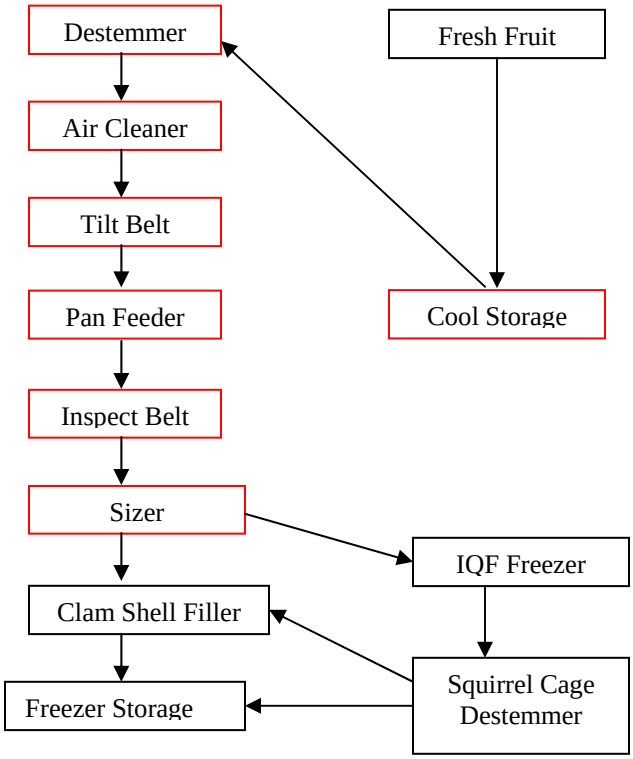


Equipment Required

1. Cool Storage 0˚C to +4˚C
2. Destemmer
3. Air cleaner
4. Tilt belt
5. Pan feeder
6. Inspection conveyor
7. Sizer
8. Clam shell filling station

Estimated Equipment Costs:
US $200,000

Phase 2. Frozen Blueberries



Additional Equipment Required

1. IQF Freezer
2. Freezer Storage -18˚C to -23˚C.
3. Squirrel Cage Destemming Cylinder

Estimated Equipment Costs:
US $500,000

Annex 14 - Equipment List for Blueberry Operations

Equipment	Cost	New/Used	Build Self	Source
Fork lift	10,000	Used	No	Domestic
Cool storage	150,000		Yes	Domestic
Destemmer	10,000	New or used	No	W. Europe
Air cleaner	5,000	New	Maybe	W. Europe
Tilt belt	5,000	New	No	Canada/U.S.A.
Pan feeder	5,000	New or used	Maybe	W. Europe
Inspection conveyor	2,000		Yes	Domestic
Sizer	2,000	New	No	Canada/U.S.A.
Clam shell filler	2,000	New or used	No	W. Europe
Pallet movers(2)	2,000	New or used	No	Domestic
Miscellaneous equipment	7,000			
Total equipment Phase 1	**200,000**			
IQF freezer	200,000	New	No	Canada
Freezer storage	298,000		Yes	Domestic
Squirrel cage destemming	2,000		Yes	Domestic
Total Equipment Phase 2	**500,000**			

Annex 15 - Process for Fresh and Frozen Pack Fruits

The process described below is generally for blueberries; however, the process is virtually the same for black currants and can be adapted for the processing of other small fruits as well.

Freshly harvested berries are kept under cover as soon as possible because sun and heat start to break down the berry. On receipt of the fruit at the processing factory the fruit is immediately placed in a cooler storage (0˚C to +4˚C). The berries are frozen within 48 hours after harvest and preferably within 24 hours. Some buyers now request their berries to be frozen within 8-10 hours after harvest. As the berries are brought from the field to the plant they are weighed. Minimizing damage to the fruit membrane (skin) is essential to maintain the highest quality IQF blueberry. Ruptures in the membrane that occur during pre- and post-processing handling lessens berry quality while in frozen storage. These changes include a loss in internal sugars, a toughening of the blueberries, and an increase in drip loss (loss in liquid from blueberries upon thawing).

The berries are dumped onto a destemmer where the stems are removed, then they flow through an air cleaner where leaves and small debris are removed. Once the berries have been cleaned they go onto a tilt belt where the good berries, which generally roll more, fall off on to a flat conveyor belt running below the tilted belt. The fruit is then inspected by staff and any fruit not conforming to standards is removed. The berries are then either sent to a pouch filler for fresh pack or a clam shell filler as an alternate package or they go through the IQF tunnel or flo-freeze IQF tunnel where the temperature is -42ºC to -45ºC. Immediately after freezing, the berries enter a "squirrel cage." This is a perforated, cone-shaped, metal cylinder and as it rotates small and split berries are ejected. It also removes the stems off the frozen berries. Frozen berries will be stored in bulk poly-lined containers or filled into small retail sized packages such as vacuum pouches, clam shells or fiber cups.

Temperature of frozen storage is extremely important in maintaining the quality of IQF fruit. The fruit should be kept at a temperature of -20°C or lower. Studies also show that temperature fluctuations in frozen storage must be minimized to avoid adverse chemical and physical changes in blueberry quality. These changes include (1) migration of sugar from the

center of the berry to the periphery, (2) increased drip loss, (3) toughening, and (4) increased block freezing.

Products That Can be Produced From Phases 1 and 2:

- Fresh berries for retail.
- Fresh berries for bakeries.
- Frozen IQF berries for retail.
- Frozen bulk IQF berries for bakeries.
- Frozen bulk IQF berries for other food manufacturers.

A recent Food Institute Report (September 2004) indicated the North American crop is expected to be about 55 million pounds below last year's crop, leading to extremely tight supplies and high prices. The 2003 processed total was 198.6 million pounds. Some packers are reporting they cannot fill orders. Pricing is reported at $1.15-$1.20/lb.

Blueberry Processing Equipment Suppliers:

Canadian:

Atlantic Systems Manufacturing Ltd.
Tel: 902-566-4144
P.O.. Box 20043 Charlottetown
PE. Canada C1A 9E3

United States:

Lakewood Manufacturing Inc.
Holland, Michigan
Email: Information@lakewoodmfg.com